

WHAT IS CLAIMED IS:

1. A process to produce N-vinylformamide including the steps of: reacting hydroxyethyl formamide with a reactant including at least one cyclic anhydride group to form an ester, and dissociating the ester to synthesize N-vinylformamide and a compound including at least one diacid group.
2. The process of Claim 1 wherein the reactant including at least one cyclic anhydride group is succinic anhydride, maleic anhydride, phthalic anhydride, a polymer including at least one cyclic anhydride group, or a solid support to which at least one cyclic anhydride group is covalently tethered.
3. A process of claim 1 wherein the cyclic anhydride is regenerated from a diacid formed in the synthesis of the ester by dehydrating the diacid.
4. The process of claim 1 where NVF is used as a solvent.
5. The process of claim 1 where toluene or acetaldehyde is used as a solvent.
6. The process of claim 2 wherein a polymer including at least one cyclic anhydride group is used.
7. The process of claim 6 further including the step of regenerating the polymer including at least one cyclic anhydride group by heating the polymeric material containing at least one diacid group to a temperature sufficiently high to dehydrate diacid groups.
8. The process of claim 7 wherein the temperature used to dehydrate diacid groups is higher than a temperature use to dissociate the ester by heat.
9. The process of claim 6 where NVF is used as a solvent.
10. The process of claim 6 where toluene or acetaldehyde is used as a solvent.
11. The process of claim 6 where a solvent is used in which NVF is soluble and in which the polymer including at least one cyclic anhydride group, the polymer including at least one ester group and the polymer including at least one diacid group having no or limited solubility in the solvent.

12. The process of claim 6 where polymer includes a plurality of cyclic anhydride groups and is a copolymer of methyl vinyl ether and maleic anhydride.

13. The process of claim 12 where in the methyl vinyl ether/maleic anhydride copolymer has a weight average molecular weight in the range of approximately 190,000 to 3,000,000.

14. The process of claim 6 wherein the polymer is a reaction product of an alpha olefin or a mixture of alpha olefins with maleic anhydride.

15. A process of claim 14 the alpha olefin is a C-18 alpha olefin and wherein the polymer has a molecular weight of at least 20,000.

16. The process of claim 6 where the polymer is a methyl vinyl ether/ maleic anhydride decadiene copolymer.

17. The process of claim 6 wherein the polymer is a copolymer of styrene and maleic anhydride.

18. The process of claim 16 wherein the copolymer has a weight average molecular weight of at least 2000.

19. The process of claim 6 wherein the polymer is a solid in the reaction.

20. The process of claim 19 wherein the polymer is a porous crosslinked solid.

21. The process of claim 20 wherein the polymer is a crosslinked polymer including styrene and maleic anhydride repeat units.

22. The process of claim 2 wherein the reactant including at least one cyclic anhydride group is a solid support to which at least one cyclic anhydride group is covalently tethered.

23. The process of claim 22 wherein the solid support is silica.

24. The process of claim 1 wherein acetaldehyde, formamide and the reactant including at least one cyclic anhydride group are mixed in a single reaction vessel, hydroxyethyl formamide being formed in the reaction vessel to react with the reactant including at least one cyclic anhydride group.

25. A process to produce N-vinylformamide including the steps of: mixing acetaldehyde, formamide and a source of anhydride in a single reaction vessel, dissociating an ester formed by a reaction between the source of anhydride and hydroxyethyl formamide formed in the reaction vessel to synthesize N-vinylformamide and a compound including at least one diacid group.

26. The process of claim 25 wherein the source of anhydride is a reactant including at least one cyclic anhydride group.

27. The process of Claim 26 wherein the reactant including at least one cyclic anhydride group is succinic anhydride, maleic anhydride, phthalic anhydride, a polymer including at least one cyclic anhydride group, or a solid support to which at least one cyclic anhydride group is covalently tethered.

28. The process of Claim 25 wherein the acetaldehyde to formamide mole ratio is at least two.

29. A process of claim 25, where a base or an acid catalyst is used in the reaction to make hydroxyethyl formamide.

30. A reagent comprising at least one cyclic anhydride group covalently tethered to a solid support.

31. The reagent of claim 30 where the solid support is silica.